INVESTMENT IN LOCAL GOVERNMENT ROADS IN TASMANIA

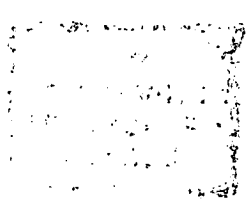
BY

C.H. FINCH

Submitted in partial fulfilment of the requirements for the Master of Transport Economics degree

THE UNIVERSITY OF TASMANIA

OCTOBER 1986



This dissertation represents my own original work and contains no material or paraphrase of material previously written by another person or authority except where due acknowledgement is made.

C.H. Finch

ACKNOWLEDGEMENTS

I would like to acknowledge the assistance of my supervisor, Mr. R.P. Rutherford, whose advice and encouragement helped me complete this dissertation.

I would also lkike to thank Mr. M.A. Brooks who introduced me to much of the background literature in public finance economics on which this dissertation is based.

TABLE OF CONTENTS

******

CHAPTER 1 - EXPENDITURE ON LOCAL ROADS

1.1 Introduction

Since 1945, expenditure on roads has constituted the largest form of capital works expenditure in Australia. In 1980/81 road expenditure exceeded $2.1 billion, equivalent to about twenty five per cent of total capital expenditure by all public authorities. Expenditure on roads was far in excess of capital spending in such areas as education, health, or power. Expenditure on local roads in Australia in 1980/81 amounted to $347 million.

Until the mid 1960's there was little attention paid to the economic efficiency of this substantial investment. While Commonwealth monies for the road system were allocated on a number of different bases, none were predicated on a desire to ensure efficient allocation of resources. Following the establishment of the Commonwealth Bureau of Roads (C.B.R.) a more conscious attempt was made to impose a measure of economic rationality into expenditure on roads.

The C.B.R. were charged with advising the Commonwealth Government on the appropriate level of road investment consistent with the overall national interest. The reports of the C.B.R. and its successor, the Bureau of Transport Economics (BTE), have provided successive Commonwealth Governments with a basis upon which to allocate monies for expenditure on roads in Australia to this day.

A consistent feature of the pattern of expenditure on roads has been that local road expenditure has been at a level that is higher than that justified by normative economic analyses using C.B.R. This dissertation will investigate the levels of expenditure on local roads and attempt to draw some conclusions on the way monies are allocated to this category of road by both State and Commonwealth Governments and also of the demand for local roads by the ratepayers of the municipalities.

The quantitative part of the investigation will be confined to Tasmania's local roads. In part, this is to make the problem more tractable, but it also allows the Author to use information supplied by the Department of Main Roads to assist in overcoming particular local anomalies.

1.2 Aim of this Dissertation

The economic analysis of the CBR relied on a cost benefit analysis. A large scale survey of the Australian road network was undertaken to determine physical deficiencies in the road system. Some 80,000 road construction projects were identified as being necessary for the improvement of the system and some 50,000 of these were subjected to economic analysis.

While the emphasis of these studies conducted in 1968, 1973, 1975 and 1979 were normative, there has been little examination of the behaviour of States and local government on a positive basis, that is, examining what they do rather than what they ought to do.

One of the limitations of cost benefit analysis is the acceptance (at least in its normal application) of the income distribution and the lack of evaluation of the distributive effects of the benefits. Clearly, the large capital expenditures on roadworks have the potential to have significant distributive effects and this is likely to be an influential factor in the distribution of road funds.

The aim of this dissertation is to investigate the demand for local government roads. There are a number of difficulties involved in this investigation and these are common to measuring the demand for other outputs of government. Conventional demand theory estimates the demand for a good using a readily definable output measure in terms of relevant economic variables such as the price of the goods and income of the purchaser. The most difficult problem in measuring the demand for local government roads is that there is no readily defined market in which consumers may purchase the output of government roads.

Accordingly, an attempt will be made to estimate the demand for local roads by the ratepayers of that municipality through a model of the political process. The model must take into account the effect on the local government electorate of the intergovernment grants which are made to assist the municipality. These grants will have the effect of expanding output beyond the level which the electorate would demand if it were the sole source of funding.

It is hoped that the model that will be developed will provide an estimate of the demand for local roads in terms of the cost of their provision. The author has been unable to find any work on this topic undertaken in Australia using this form of model. Further, the model itself breaks new ground in one aspect of its development in providing a means of combining the different forms of grant provided by State and Commonwealth Government.

1.3 The Median Voter Model

The expenditure on roads by local authorities in Tasmania is a significant component of total expenditure. In twenty four of the forty nine municipalities, expenditure in 1981 on roads accounted for more than half of the total municipal expenditure. In these municipalities no other single important item of services is provided by the municipality.

The expenditure of local authorities will be examined using a model based upon the political process. The underlying assumption is that the economic welfare of the electorate is inextricably linked with the voting behaviour of the electorate. The public choice model that will be developed assumes that the level of road expenditure is effectively decided at the ballot box with the electorate casting their votes based on the benefits they expect to receive for a given level of taxation. The municipal councillors that are elected will have a combined platform that is closest to the desires of the majority of the electorate.

If everyone had the same individual preferences there would be unanimity over the level of public expenditure. However, as the level of expenditure and of taxation has different effects on the income of each voter, preferred levels of expenditure differ. Within certain constraints it can be shown that the outcome of an election will be decided by the median voter and that the candidate elected will most closely represent his preferences.

A number of obvious issues need to be addressed before this simple conceptual model may be translated into a working model suitable for empirical work. These include the shape of voter preferences, voter abstention, multiple issues, voter information including fiscal illusion and the effect of intergovernmental grants. There are also inherent problems in measuring the output of local government as, for many goods and services including roads, no satisfactory physical measure can be found.

1.4 Arrangement of Dissertation

The Dissertation consists of seven chapters. Chapters two and three discuss how each level of government is responsible for the local authority road network and the contribution each makes to its funding. The fourth chapter develops the demand model for Local Government roads. The fifth chapter will describe the data to be used in the model and present the results of the estimation. The sixth chapter will discuss the results of the model estimations and effect of the many assumptions inherent in the model on the results obtained. The final chapter will summarise the issues raised in the dissertation and attempt to reconcile these with the results obtained from the model estimations.

******

CHAPTER 2 : THE ROAD TASK OF LOCAL GOVERNMENT IN TASMANIA

2.1 Responsibility of Government for Roads

Under the Australian Constitution, it is the States who have the primary responsibility for roads. However, since 1922, the Commonwealth, acting through Section 96 of the Constitution, has made available grants for the express purpose of constructing roads. Similarly, local government authorities in each of the States have been delegated much of the direct responsibility for the network of local roads.

After Federation, each State set up Roads Boards that determined which roads would be the responsibility of the State Government, coordinated a strategy for the development of roads, and arranged with local government a system of disbursing assistance for local roads in an equitable manner.

In Tasmania a road hierarchy was established of Highways, Main Roads, Secondary Roads, Tourist Roads, Developmental Roads and Subsidised Roads. All other roads were to be the complete responsibility of local government. In return, the local councils received an allocation of funds for maintenance and construction of roads. In Australia as a whole, arterial roads equivalent to State Highways and Main Roads in the Tasmanian classification system, comprise less than 15% of the total road network while carrying 70% of the total traffic flow. In Tasmania there is insufficient data on vehicle usage to derive comparable statistics. However, of the 19,369 km of roads in Tasmania, 15,670 km or 80.9% are local roads.

2.2 Responsibilities of the Commonwealth Government

The Commonwealth has, since 1922, assisted the States by making grants for roadworks. The present method by which grants are determined has its origins in the Commonwealth Aid Roads Act (1964). This Act established the Commonwealth Bureau of Roads (C.B.R.) whose function was to determine the extent of road needs in Australia and to assist the Commonwealth Government in the consideration of grants of financial assistance to the States.

From 1931 to 1959, Commonwealth funding of road construction was based on fuel tax revenues. The distribution between mainland States was on the basis of area (2/5) and population with Tasmania receiving 5% of the total allocation. From 1960 onwards the relationship between fuel tax and road grants was severed and until 1969 the mainland States were given grants based on area (1/3), number of motor vehicles (1/3) and population (1/3), with Tasmania again receiving 5% of the total allocation.

In 1964 the Commonwealth Bureau of Roads Act established the C.B.R. who were to be responsible for determining a level of expenditure based on national economic interest. The Bureau made its first report in 1968. This, together with successive reports made in 1973 and 1975, and by the Bureau of Transport Economics in 1979, has been the basis for Commonwealth road allocation since 1969.

Commonwealth road grants have been distributed to the States through a succession of Roads Grant Act typically on a triennial basis. The most recent legislation has been the (Commonwealth) Roads Grant Act (1983).

The Commonwealth maintains direct control only of National Roads. These were established in the 1974 National Roads Act. At the local level, the States are given the option of submitting detailed programs of local roadworks or a program outlining expenditure to be taken by State and local government in either of the two local roads categories. Commonwealth grants are offered on a quota basis. The States are required to match the Commonwealth grant with a minimum level of funding. This ensures that Commonwealth road grants are not used as a means to allow States to spend their road funds on other goods or services.

The Commonwealth recognises the role of local government by directing a proportion of funds directly to local government, although the allocation of funds to individual municipalities is the responsibility of State governments.

The Commonwealth has its own road classification system which is used for fund allocation. However, the State Government which allocates both State and Commonwealth grants jointly, uses the State system as the basis of its allocative process. The basis of State allocation is described in Section 3.3.

2.3 The role of the State Government

The Department of Main Roads is the State Road Authority in Tasmania. It has the responsibility for advising the Government which roads shall be classified and thus accepted as being the responsibility of the State. The State is also able to submit some of its roads for inclusion in the National Roads Program set up under the National Roads Act (1974). As well as National Highways linking the principal population centres, Hobart, Launceston, Devonport and Burnie, this program has also included as a National Commerce Road the highway between Launceston and the port of Bell Bay.

The State Road network has changed relatively little in recent years and many classified roads carry little traffic. This may be seen partly as a subsidy to more rural areas in that the road network of local government is reduced. There are more overt subsidies in the form of Developmental and Subsidised Roads. Most Developmental Roads are located on the West Coast and link mining developments with the State Road system. Subsidised Roads are municipal roads which are maintained at the expense of the State Government. The longest of these, Coles Bay Road, was classified by the Department of Main Roads in 1983.

Since the State has the primary responsibility for roads and the technical resources with which to manage them, the Department of Main Roads has the responsibility for allocating Commonwealth and State grants for roads to the municipalities. The Department also oversees the construction of local roads and is able to offer technical assistance to local authorities.

2.4 The Structure and Responsibilities of Local Government in Tasmania

The Structure of Local Government in Tasmania was reorganised in 1906 into its present form. Under the Local Government Act (1906) the administration of local government duties was to be undertaken by districts of which there were to be no more than sixty. A Commission, set up under the Act, recommended that there be 50 divisions together with the two existing cities of Hobart and Launceston.

Subsequently, 3 municipalities were amalgamated with neighbouring Cities and two municipalities were proclaimed as Cities - Glenorchy and Devonport.

The 1906 Act was replaced by the Local Government Act (1962) which consolidated this and other legislation into the one Act. The two Cities, Hobart and Launceston, still operate under separate Acts of Corporation while Devonport and Glenorchy remain under the Local Government Act.

The municipalities are run by municipal councils. These may consist of six, nine, twelve or fifteen councillors depending on the size of municipality. The principal office bearers, Warden, Deputy Warden and Treasurer, are elected by the Council. Those eligible to vote in Council elections are owners or occupiers of rateable land who must be British subjects. There is also a separate category of residence electors who must have lived in the electorate six months and be enrolled as an elector for the State Legislative Council or House of Assembly. The term of office for each Councillor is three years with one third of the Council retiring each year.

The Minister administering the Local Government Act may, for a number of reasons, suspend the elected Council. Most usually this occurs following a petition of ratepayers and a poll of municipal electors. In the past five years two Councils have been run by Ministerially appointed Commissions. These were Zeehan on the west coast of Tasmania and Lilydale near Launceston, from 1982.

The functions of the municipalities are set out in the Local Government Act Section 176.

> "A Municipality (a) may make for the welfare and government of its district and the inhabitants thereof
>
> i) make by-laws
>
> ii) undertake, make and maintain works, buildings and services
>
> iii) order and dispose the common affairs of its members
>
> and, (b) shall cause the Queen's peace to be kept and maintained within its districts."

The municipalities are responsible for determining which road projects they require to be undertaken and for their planning, design, and construction. The municipalities are also responsible for raising funds for roadworks by a combination of levying rates and gaining assistance from the State Government. The municipal council has the task of balancing local priorities for roadworks against the level of rates imposed on the municipal electorate.

******

CHAPTER 3 - FINANCE FOR LOCAL GOVERNMENT WORKS

3.1 Sources of Local Government Finance

Local government derives the funds it requires to carry out capital works from three sources. It may levy rates on the owners of property located within the municipality. The municipality may receive capital grants from either State or Commonwealth Governments. Finally, the municipality may apply to the State Government for loan funds for certain approved classes of projects.

In Tasmania, local roads receive funds from all three of the sources outlined above. The following sections will consider the mechanisms by which Tasmanian municipalities derive funds from each of these sources.

3.2 Municipal Rates

Under the Local Government Act (1962), municipal councils are authorised to levy rates based on the assessed annual value of the property, the capital value of the property, or a combination of the two. The assessed annual value is the annual income that the landowner could obtain by letting the land and any fixtures upon it to a tenant. The capital value is the value of the land together with any improvements. Valuations are carried out by the Land Valuation Branch of the Lands Department. Each municipality is completely valued in a single year and revaluations take place at five year intervals.

In most Tasmanian municipalities the rate is broken into specific categories of expenditure. In the case of local roads, almost all municipalties establish a Road Rate Account which receives rate income dedicated to road works. A number of municipalities strike separate rates for different categories of expenditure so that ratepayers can identify exactly how much they are paying for roads, water supply, sewerage and other goods and services provided by other municipalities. In other municipalities the council advise ratepayers of the proportion of rates allocated to the services provided by the municipality.

The Road Rate Account is used to pay road maintenance, engineering and supervision costs, materials, plant hire and any Council contribution to any intergovernmental matching grants. A study of municipal accounts published in the Tasmanian Government Gazette showed that none of the municipalities that had established Road Rate Accounts had transferred monies from that account to other municipal accounts apart from those strictly relating to roads. No municipality had transferred monies from other rate accounts for use on local government roads.

The use of separate rate accounts for each category of municipal expenditure is employed mainly by the smaller municipalities where the full range of municipal services are not provided to all ratepayers, for example, sewerage or water. In the larger municipalities, ratepayers are provided with a breakdown of overall municipal expenditures into particular categories.

3.3 Intergovernmental Contribution to Local Authorities for Roadworks

Under the Commonwealth Roads Acts the Commonwealth disburses grants for local government roadworks. These grants are then passed on to local authorities through the State Road Authorities.

States are given the option of submitting to the Commonwealth detailed programs of works or a program outlining expenditure to be undertaken by State and local government authorities on urban and rural local roads.

In Tasmania, these Commonwealth grants are allocated in different ways depending on whether they are urban or rural local roads. Urban road grants are allocated to municipalities and cities in the Hobart and Launceston statistical divisions. For the Hobart division, this includes the cities of Hobart and Glenorchy and the municipalities of Clarence, Sorell, Kingborough and Brighton and the Launceston division includes the city of Launceston and all or parts of the municipalities of St. Leonards, Beaconsfield, George Town, Lilydale, Evandale and Longford. Rural local road grants are allocated to other municipalities in Tasmania.

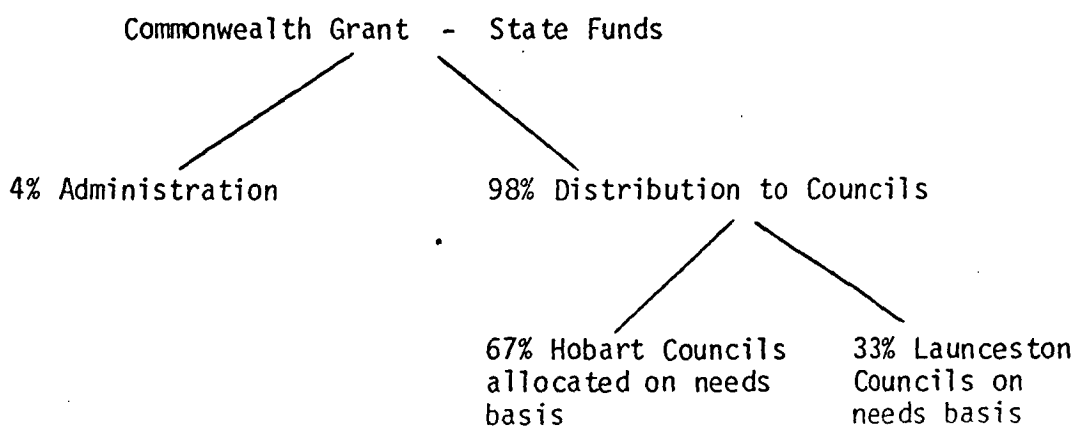
The disbursement of urban local road grants is detailed in Figure 3.1. Commonwealth and State funds are pooled together and allocated jointly.

Rural local grants are allocated on a different basis. One third of Commonwealth grants is allocated to the Department of Main Roads. Three quarters of this is spent on bridges on rural local roads. Under the State Roads and Jetties Act the Department of Main Roads is responsible for all expenditure on bridges and culverts greater than $140. The remaining 25% is spent on classified rural local roads.

The two-thirds of Commonwealth grants allocated to local authorities is divided into maintenance and construction. The division between the two categories has been varied from time to time. Up until 1981, maintenance was allocated on the basis of a formula, 50% in proportion to road length, 25% in proportion to population and 25% to the five year average of the road rate levy. In 1979/80 the maintenance grant made up 30% of the allocation to local authorities. The remainder is allocated on a needs basis. Councils are required to submit programs of road projects to the Department of Main Roads. The Department then allocates road funds on a priority basis.

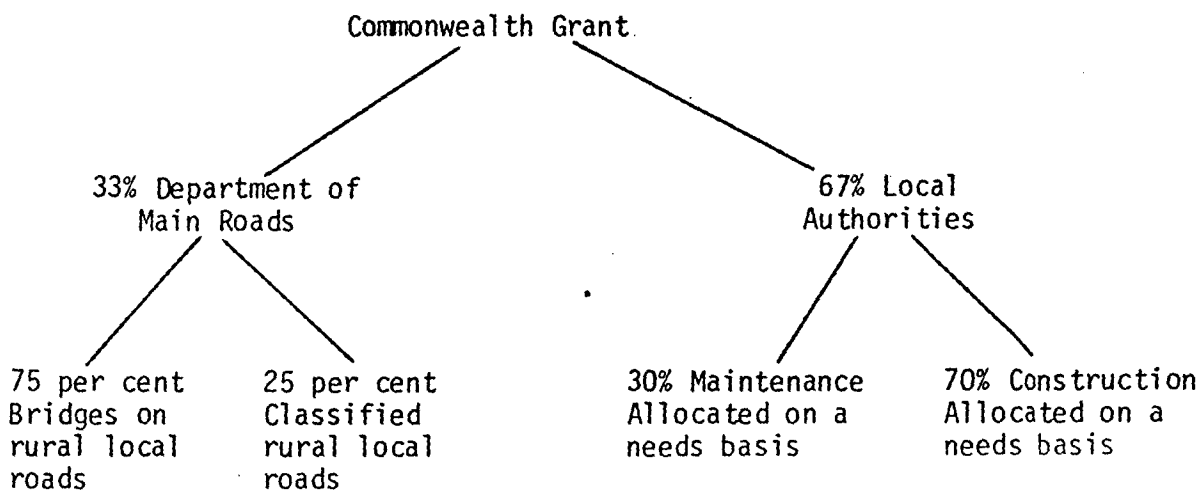
The allocation of rural local road grants is shown on Fig. 3.2.

TABLE 3.1 Allocation of Urban Local Road Grant in Tasmania (1979-80)



Source: ACIR (1981)

TABLE 3.2 Allocation of Rural Local Road Grant in Tasmania (1979-80)



NOTE: Maintenance grant was allocated according to the following formula:-

50% allocated in proportion to road length
25% allocated in proportion to population
25% allocated in proportion to the five year average of the Road Rate Levy

Source: ACIR (1981)

3.4 Intergovernmental Grants for Other Goods and Services

The disbursement of State and Commonwealth Grants to local authorities for goods and services other than roads is controlled by the State Grants Commission Act 1976. This established the State Grants Commission whose role as defined by Section 9 (2) (d) of the Act is to recommend grants to local authorities in such a way that

'the Commission shall ensure that as far as possible that amount is sufficient to enable the municipality by reasonable effort, to function at a standard not appreciably below that of other municipalities, that in the opinion of the Commission are similar...'.

The Commission is, moreover, required by the Local Government (Personal Income Tax Sharing) Act 1976, a Commonwealth Act, to

'allocate not less than 30 per cent of the amount to which it is entitled ... amongst local governing bodies in the State on a population basis' (Section 6 (2) (a)).

The Commission has chosen not to allocate funds so as to equalise standard and then deduct the 30% population component, but rather to allocate 30% according to population and divide the remaining 70% on a basis of equalisation between municipalities (State Grants Commission Annual Report (1978).

The grant required to compensate municipalites for their revenue disabilities is determined by measuring the relative revenue per capita yield of a uniform rate of tax. Councils' rates are based on assessed annual values. Each municipality is revalued at one time, every five years. An index of relative rateable capacity is made based on an assessment by the Valuer General of land price movements since the last valuation and discounting for such factors as differing social, economic and physical characteristics. These factors include, for example, the number of pensioners, adverse seasonal conditions, or if a major industry has suffered a setback. (S.G.C. Annual Report (1978).)

Section 9 (2) (d) of the Act (1976) both requires that there should be 'reasonable effort' in revenue raising and that the municipality should 'function at a standard not appreciably below that of other municipalities'... Accordingly, the Commission has established six expenditure categories - administration, roads, debt charges, health and welfare services, services for non-residents and other unclassified expenditure. Expenditure is analysed so as to identify differences in unit costs.

The Commission then puts together the results of its assessment of the costs and revenues of the municipalities and adds up the separate adjustments. The total disability on the expenditure and the appropriate revenue adjustment gives the assessed grant for each municipality. The assessed grant is then compared with grants to other municipalities of similar characteristics and also to the grant given to the municipality in the previous year. Account is also taken of other grants given by Government for local government services such as roads, water and sewerage. Accordingly, it may be taken that road grants and State Grants grants are decided simultaneously.

CHAPTER 4 : A THEORETICAL MODEL FOR LOCAL GOVERNMENT EXPENDITURE ON ROADWORKS

4.1 Introduction

In the introductory chapter it was noted that most economic assessment of road investment in Australia had been centred around the use of cost benefit analysis. This was the basis used for determining the optimal allocation of funds in the three reports of the Commonwealth Bureau of Roads (C.B.R., 1968,1973,1975) and subsequently by the Bureau of Transport Economics (B.T.E., 1979).

This dissertation examines local road expenditure from the point of view of the voter who is seen as the purchaser of road services. In the previous chapter the methods of financing local road expenditure were noted in Sections 3.2 and 3.3. The magnitude of road investment at least makes it implicityly a significant electoral issue in all Tasmanian municipalities, and in twenty four of the forty nine municipalities expenditure on local roads accounts for more than half the total municipal expenditure. Moreover, in these latter municipalities no other single important item of services is provided by the council.

The public choice model developed in this chapter assumes that the level of local road expenditure is decided at the municipal ballot box and views public choice as the outcome of majority voting, where voting is a procedure for arriving at a collective decision when voters have different tastes or endowments and where their individual preferences on fiscal policies are likely to differ.

4.2 The Voting Model

The development of models describing public choice has a long history beginning with Hotelling (1929). The models are all predicated on the assumption that both voters and their prospective representatives will act in a rational manner by attempting to maximise their respective utilities. For the voter, this means the maximisation of benefits in terms of goods and services provided by the municipality for a given cost. The councillors, on the other hand, are assumed in the words of Downs (1957) -

> "to formulate policies in order to win elections rather than win elections to formulate policies"

In the model that will be developed in this chapter the voter is assumed to cast his vote for the benefit that he will receive from a given output of goods which he will pay for from taxes. The level of utility of the voter will depend only on his disposable income and the level of spending on municipal goods. The municipal councillors that are elected will have a combined platform that is closest to the desires of the majority of the electorate.

Figure 4.1.a shows the individual decision process. An individual has a certain income which is shown in the diagram as his private goods. The locus of all possible combinations of his expenditure on private and public goods is his budget line, AB in the diagram. The individual voter maximises his utility at some combination of public and private goods at public good output G. In figure 4.1.b this is represented as the maximum utility that he can obtain for his given budget.

If everyone had the same preferences as the individual in the diagram, then there would be unanimity over the level of public expenditure. The dashed lines in Figure 4.1.b show alternative preferences held by other members of the electorate. Since there can only be one decision which in the case of municipal elections is decided by a simple majority, the combination of preferences adopted by the candidate will be those of the decisive voter, the median voter. The median moter model in its simplest form above assumes that the policies offered to the electorate by candidates lie upon a single dimension. Each voter is assumed to have a preferred position along this dimension and the further that the policies of a candidate differ from this position the less desirable would be his election to the voter.

The simple frequency distribution of voter preferences, shown in Figure 4.2.a will be faced by candidates who must adopt strategies to maximise their chances of election. If every voter votes and has the choice of voting for one of two candidates L and R then all those voters with a preferred position to the left of X , the mid point between the candidates will vote for candidate L while those to the right of X will vote for candidate R. If there are more voters with preferences to the right of X then candidate R wins. However, candidate L could increase his share of the vote by moving his platform toward R shifting X to the right. Similarly, candidate R can move his position toward L. As elections are decided by the median voter, candidates aim to ensure that as many voters as possible have preferences on their side of the mid point between the candidates. Both candidates are thus driven to the position favoured by the median voter.

This model of voter behaviour was put forward by Hotelling as the rational outcome of two party democracy. The model was further developed in Down's major work "An Economic Theory of Democracy". The median voter model makes strong predictions, but at the expense of some heroic assumptions. Subsequent writers have sought to relax these assumptions.

4.3 Assumptions Implicit in the Median Voting Model

The first assumption to be relaxed is to consider an alternative distribution of preferences. It can clearly be seen from Figure 4.2.b that whatever the shape of the distribution of preferences, as long as all voters vote, the voters lying between a candidate's position and the tail of the distribution must vote for that candidate. As Black (1958) points out, the likely unimodal distribution will be a single peaked plateau. A candidate can optimise his vote by moving toward the median and taking votes from the other candidate. A similar strategy operates for the other candidate so the logical strategy for all candidates is to aim to represent the median voter.

The next step in the consideration of the median voter model is to consider voter abstention. A prominent feature of Tasmanian municipal elections is the low level of participation by the electorate. Voter abstention may be due to the policy positions of candidates being too close to each other, causing indifference in the electorate or being too far away, causing alienation. As Mueller (1979) states

> "If the probability that a voter does not vote is an increasing function of the closeness of candidates' position a movement toward the centre of a symmetric distribution of preferences has a symmetric effect on the candidate vote totals. The pull of the median remains and the equilibrium is again at the median. Indifference does not affect this result".

Similarly, a candidate is pulled toward the median of the distribution of policies if the probability of voter abstention through alienation is an increasing function of the distance of a candidate's policy from that of the voter.

Thus, voter abstention, either through indifference or alienation or a combination of both, will not affect the tendency of candidates to tailor their policy toward that of the median voter.

The next assumption that must be considered is the distribution of voter preferences for particular policies. Stokes (1963) challenged the model proposed by Downs by questioning the continuous distribution of preferences. Figure 4.2.c shows a distribution which is discontinuous. This could easily arise on issues where public opinion is sufficiently polarised, for example, abortion or nuclear disarmament. In this case, the effect of alienation to one part of the electorate would predominate and this would force candidates to take a policy toward one of the two modes. In this dissertation, the municipal good under consideration - roads - is considered to have a continuous distribution and it is thought likely that the mode and the median are sufficiently close for the assumption that the median voter is the decisive voter to be tenable.

FIGURE 4.1.a

INDIVIDUAL PREFERENCE FOR OUTPUT OF MUNICIPAL GOODS

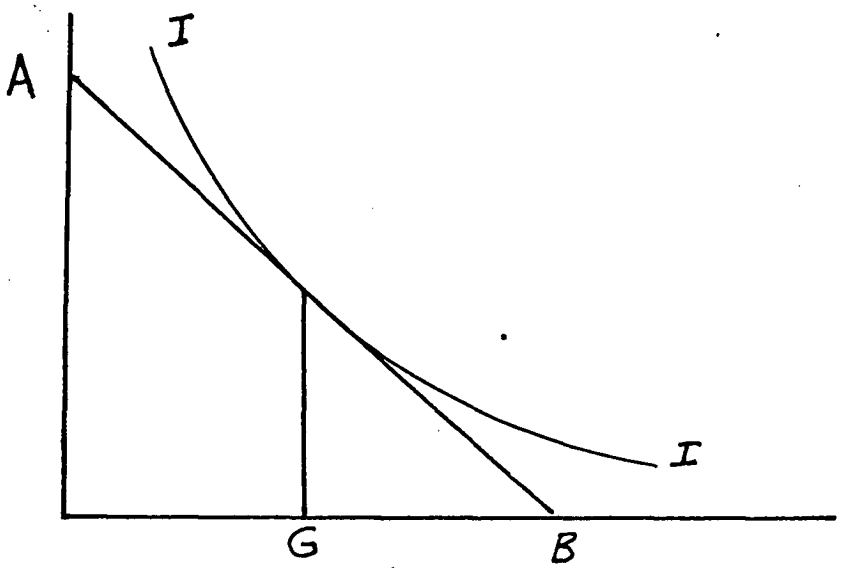
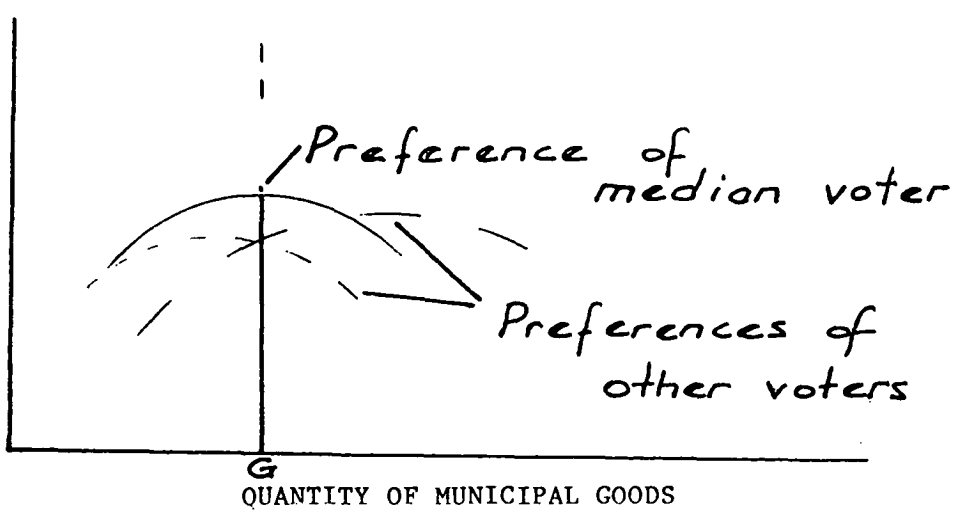


FIGURE 4.1.b

OPTIMUM OUTPUT OF PUBLIC GOODS



SOURCE : ATKINSON AND STIGLITZ(1980)

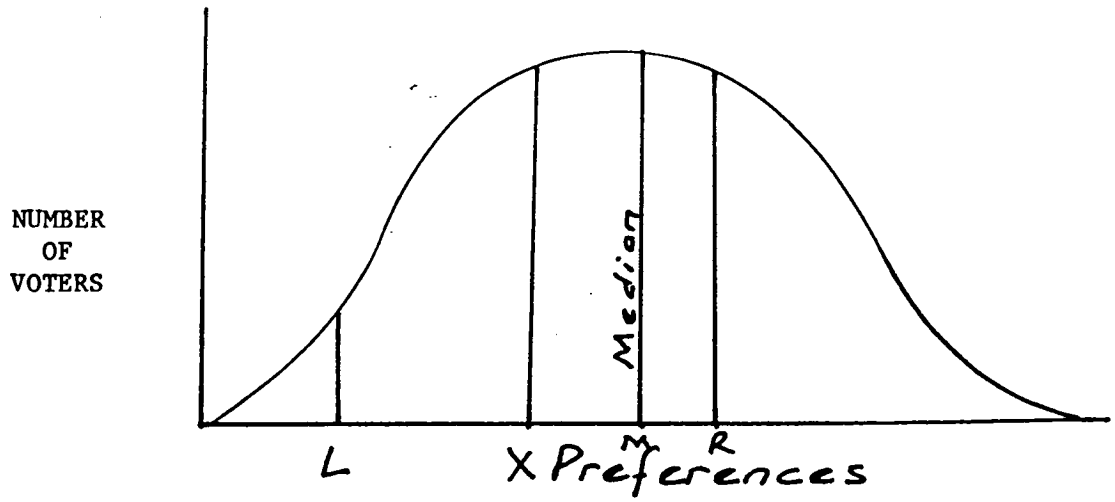


FIGURE 4.2.a UNIMODAL AND SYMETRIC DISTRIBUTION OF VOTER PREFERENCES

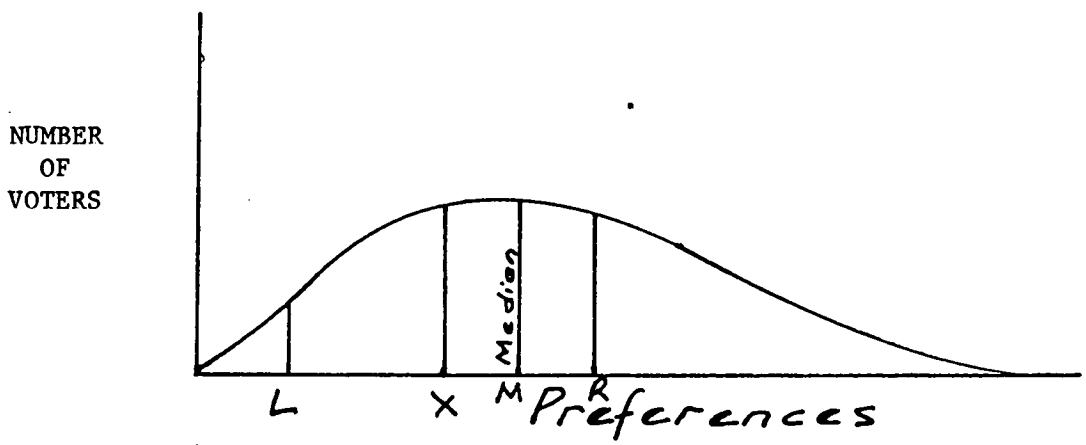


FIGURE 4.2.b UNIMODAL AND ASYMETRIC DISTRIBUTION OF VOTER PREFERENCES

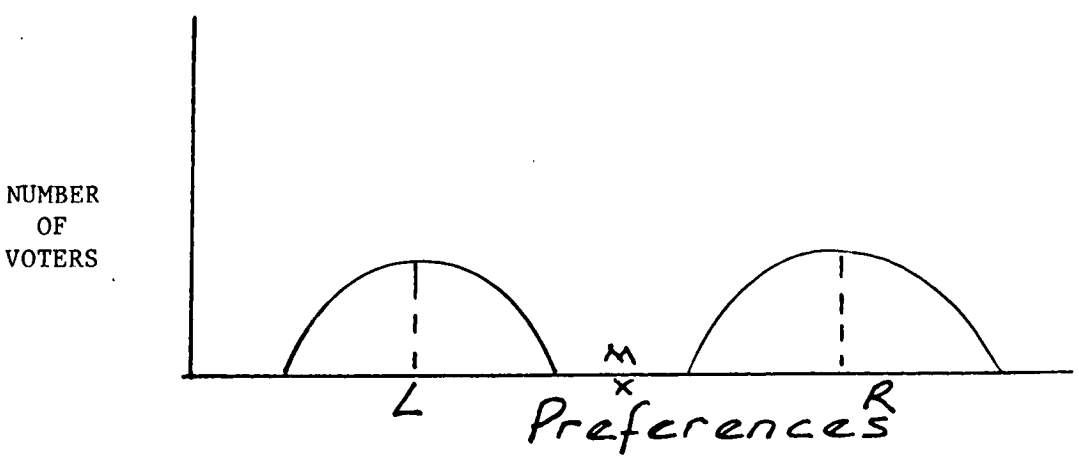


FIGURE 4.2.c DISCONTINUOUS DISTRIBUTION OF VOTER PREFERENCES

A more difficult assumption inherent in the model is that of considering elections to be about the one issue that becomes the concern of all of the electorate. Clearly, most local government elections are over a wide range of issues, though the number and complexity of these issues is relatively constrained compared to State and Commonwealth elections. However, the presence of a number of issues with the consequent multi-dimensional distribution of voter preferences combined with the presence of voter alienation may lead to the possibility of a candidate presenting a policy platform of extreme positions where the support of minorities is in sufficient number to defeat another candidate who adopts a median position on all. The voters who hold extreme views on particular issues are trading off votes on other issues to support particular views. This can lead to cyclical voting which in a two candidate system would show itself as the continual defeat of the incumbent.

The problem of a multi modal distribution of voter preferences is theoretically difficult to overcome. At a local government level, two factors point to the strength of the median voter model. The first is that, in over half the Tasmanian municipalities, expenditure on local roads accounts for more than half of total expenditure.. In the absence of political parties presenting a coalition of issues in one platform, it is unlikely that an elected Council would support a coalition of minority issues over the dominant area of municipal expenditure. The second consideration is that the composition of councils remains reasonably constant over time indicating that cyclical voting is not evident. If cyclical voting were present, it would indicate that voter preferences were not single peaked. Empirical support for the median voter demand model has been given by the results of authors such as Borcherding and Deacon (1972) and Bergstrom and Goodman (1973).

While the median voter model may not always be stable in certain situations when electors vote on several issues simultaneously, it is considered to provide, in the Tasmanian context, a satisfactory basis for the examination of the demand for government goods and services.

Finally, there are the difficulties caused by the strong information requirements of the electorate who must be able to assess the benefits from public spending and the implications for taxation. It will be necessary for the voter to separate the cost of roads from other goods and services and to consider the impacts of inter-governmental grants on the output of roads by the municipality.

The first of these problems - the cost to the ratepayer of his contribution to the cost of roads - is the more easily overcome. Most of the smaller Tasmanian municipalities strike separate rates for particular goods and services provided. The need for this arises because not all services, for example, water and sewerage, are provided to all ratepayers. In larger municipalities, ratepayers are provided with a breakdown of municipal expenditure. The second problem, that of intergovernmental grants, may have the effect of expanding output. This is dealt with in the following section.

4.4 The effects of Intergovernmental Grants

For a voter to make rational informed decisions at elections, he must know how much he will pay for a given amount of benefit. Tasmanian municipalities receive grants both for roads and for other goods and services. These grants are derived from funds provided by both State and Commonwealth governments and which are allocated, in the main, by the State Government.

The effect of intergovernmental grants may be to expand output, either by reducing the cost of the municipal good or service or by increasing the quantum of funds that may be expended. The grants alter the perceived link between rates collected by the municipality and the goods and services provided. Thus, if there were no intergovernmental grants, then a voter would reasonably expect that a 10 per cent increase in rates would be matched by a 10 per cent increase in output of municipal goods and services. However, if municipal expenditure is partially funded from intergovernmental grants, then this will no longer be the case.

This section then will examine the effect of intergovernmental grants on municipal expenditure. It will be shown that the effects of these grants vary, depending on whether they are matching grants or lump sum grants. A theory will be developed to show how local government expenditure is expanded by the effect of the two forms of grant.

In Tasmania, local authorities receive grants for roadworks from both State and Commonwealth governments. These grants are administered by the (State) Department of Main Roads. Matching grants are provided for road sealing on a dollar for dollar basis. Lump sum grants are provided for all other forms of roadworks. Matching grants operate in a different way to lump sum grants in that they lower the tax price of the goods attracting the grant. Lump sum grants do not affect tax prices but make more income available to the community.

4.4.1 Matching Grants

The effect of a matching grant is shown in Figure 4.3. The pre-grant budget line is AB. The slope of the budget line, P, is the ratio of the expenditures on private and on municipal goods. If the price of private goods is set at unity the slope of the budget line, P, is the tax price paid by the voter. This tax price is levied through the rates charged by the municipal council. The matching grant lowers the tax price to the electorate from AB before the grant to AE.

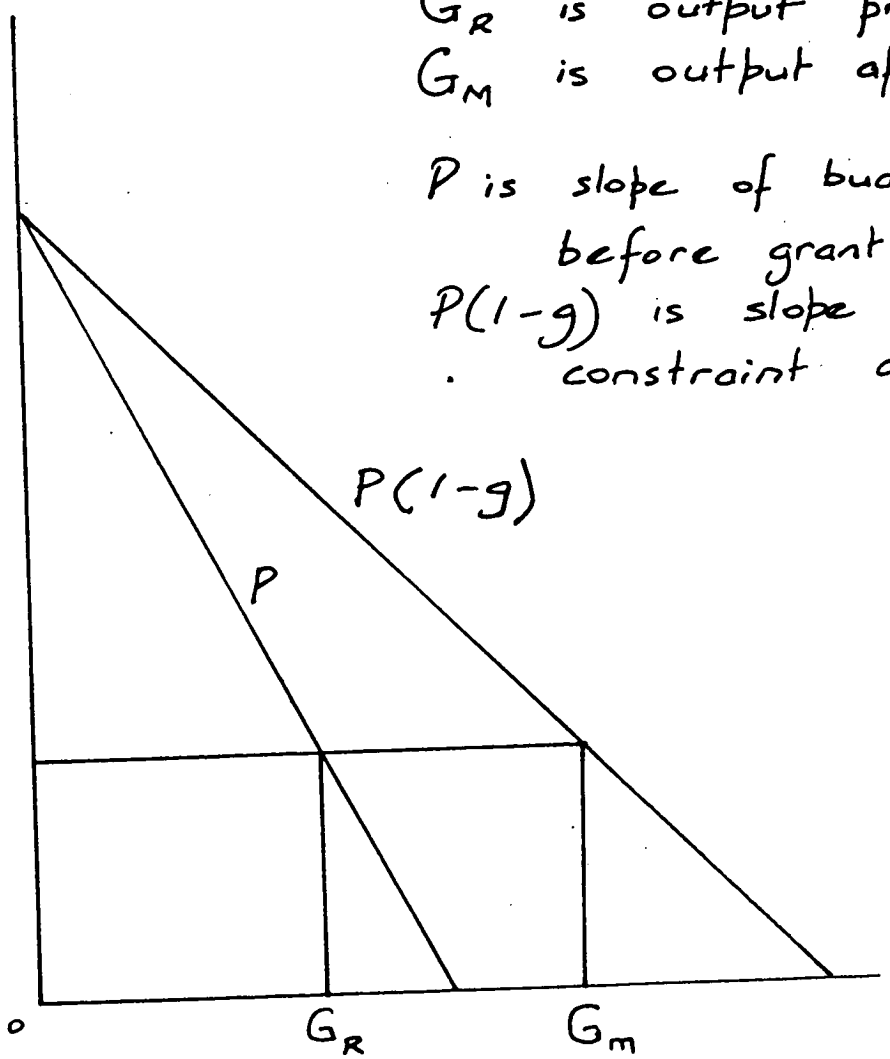
It is assumed that before the matching grant is awarded, output of municipal goods will be G_R. After the provision of the grant, output will be at G_M.

FIGURE 4.3

EFFECT OF A MATCHING GRANT ON THE OUTPUT OF MUNICIPAL GOODS

G_R is output pregrant
G_M is output after grant

P is slope of budget constraint before grant
P(1-g) is slope of budget constraint after grant



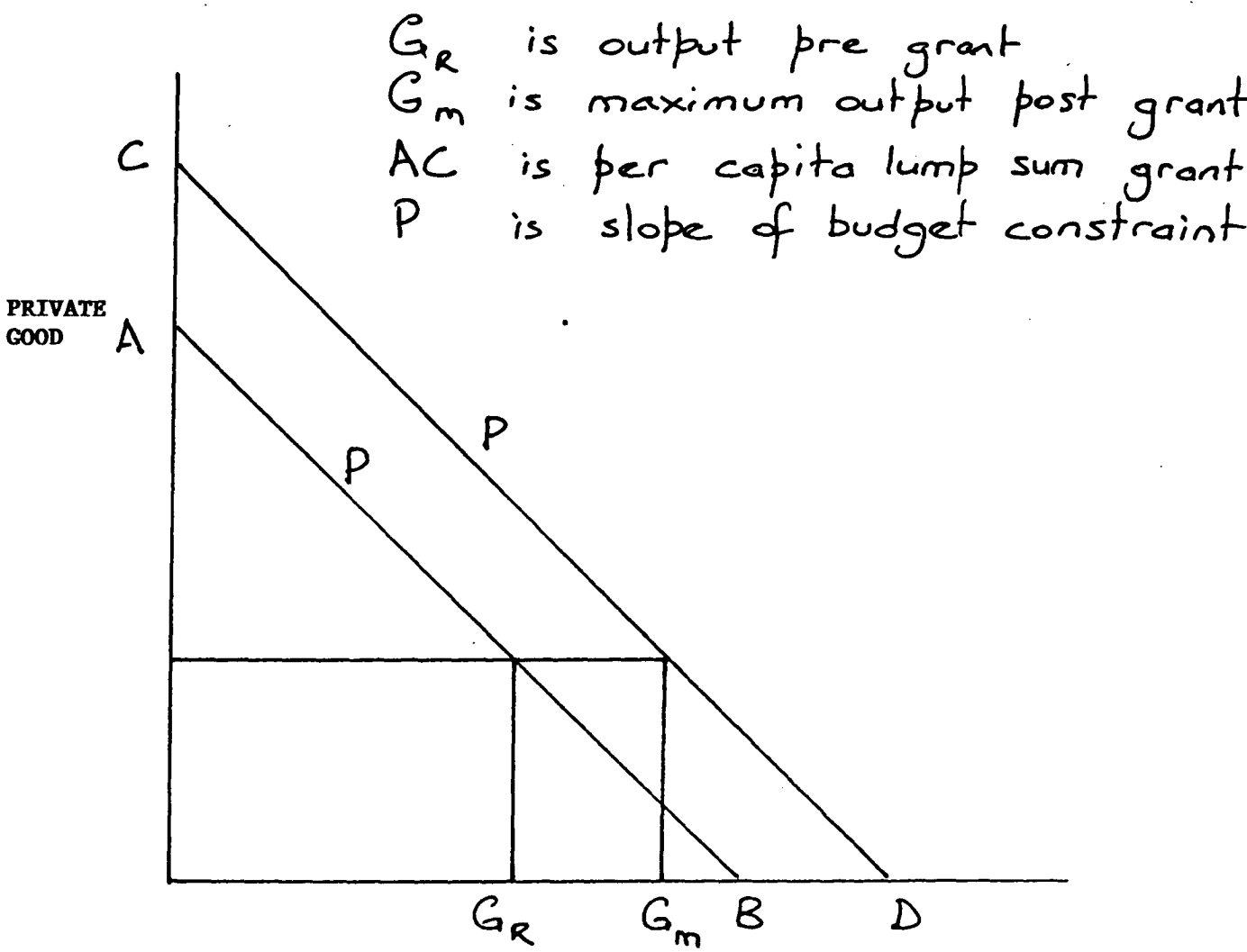
PRIVATE GOOD

PUBLIC GOOD

SOURCE : BRADFORD AND OATES (1971)

FIGURE 4.4

EFFECT OF A LUMP SUM GRANT ON THE OUTPUT OF MUNICIPAL GOODS



SOURCE : BRADFORD AND OATES (1971)

4.4.2 Lump Sum Grants

Lump sum grants do not affect the price of local government output. The effect of intergovernmental lump sum grants is shown in Figure 4.4. Again the pre-grant budget line is AB and this line represents the trade off between the individual's expenditure on private goods (income) and his expenditure on municipal goods. The provision of a lump sum grant, represented as a per capita measure in Figure 4.4 by AC, does not alter the tax price of the municipal good represented by the new budget line CD which also has a slope, P, assuming that the price of private goods is again set at unity.

Before the grant is awarded, it is assumed output will be at G_R. If the local authority maintains its expenditure on municipal goods and does not use the grant to reduce the level of its own taxes output, post grant will be at G_M. The increase in output will be the amount of the grant multiplied by the tax price, P.

It would be possible for a lump sum grant to be used either for other goods and services or to lower tax rates. In Tasmania, however, road grants are hypothecated for roads so that roads grants cannot be spent on other goods and services. In order to corroborate this, an examination was made of the accounts of all Tasmanian municipalities. This confirmed that no such transfers were made in the year under consideration.

4.4.3 Effect of Matching and Lump Sum Grants on the Price of Municipal Goods

The two forms of grant thus act in different ways. The matching grant increases output by lowering the tax price while a lump sum grant increases the income available to the municipality with which it may purchase goods.

The reduction in tax price will be reduced by a factor equal to one minus the ratio of municipal expenditure supplied by matching grant to total municipal expenditure.

For example Atkinson and Stiglitz (1980) propose that the marginal tax price for every dollar expended on a public good could be represented by $1 per head of population. In this case if the ratio of matching grant to total expenditure by the municipality is denoted by g then the tax price for public goods provided by the municipality will be given by

$$P = \frac{\$1}{N} \quad (1-g)$$

where P is the tax price paid by the voter for a particular good
N is the number of voters
g is the ratio of matching grant to total municipal expenditure for that good.

4.5 The Distribution and Measurement of Municipal Goods and Services

Before a model of local government expenditure can be derived two further issues need to be addressed. Economists working in the field of public choice have introduced a division in the types of goods and services that may be provided by government. Goods and services may be either public goods or private goods.

Sammelson (1954) defined a public good as being such

"that each individual's consumption leads to no subtraction from any other individual's consumption of that good"

As Mueller (1979) points out

"A pure public good is characterised by indivisibilities in production or jointness of supply, and the impossibility or inefficiency of excluding others from its consumption, once it has been supplied to some members of the community."

At the local government level, many of the services provided by the Council are by nature private goods. Garbage collection, street lighting, drainage, water etc. would not be public goods according to either of the definitions above. While a trunk sewer may be available for all the houses in a street, it is a private good because each house must make a connection to the sewer so that it cannot be said to be freely available to everyone. On the other hand, roads closely approximate to a public good as all are free to drive along every public road in the municipality, even if they may not wish to. The exception to this case occurs where a road is congested and the use of the road by an additional motorist increases the costs of the other road users. In Tasmania, there are only a few instances of local government roads that carry sufficient volumes to suffer congestion. Roads that connect municipalities obviously confer benefits to those outside the municipality who are not ratepayers. In practice, in Tasmania there are few instances of roads carrying significant traffic volumes between municipalities that are not funded directly by the State. Accordingly, it has been assumed that this is not a significant problem in the proposed model.

As roads are equally available to all, the cost of roads may be obtained by dividing total expnditure on roads by the population of the municipality. In the case of other "private" goods provided by the municipality, it is not possible to determine the incidence of their cost through the community because the quantity of these goods consumed will vary with each household or each voter.

The implications of this in the empirical estimation of demand for municipal services is that the model should only include roads in the dependent variable. The independent variables would be the level of income of the voter and the price to him of roads.

The other conceptual problem to be addressed is in measuring the physical output of roadworks produced in a year by a municipality. Physical measures such as the extent of roadworks or the length of sealed road do not necesarily correlate with the municipal expenditure on roadworks. The main reason for this is the high proportion of maintenance works undertaken by local authorities on their road network.

The cost of these maintenance works is not related to the length of road maintained because the work involved may vary from cleaning ditches or filling in potholes to the reconstruction of a failed pavement. The range in costs may extend from a few dollars a kilometre to tens of thousands of dollars per kilometre.

Accordingly, the level of expenditure by the municipality on roads, including all intergovernmental grants, will be used as the measure of output of the municipality.

4.6 The Model of Local Government Expenditure

This section will develop a model of Local Government expenditure based on the political process and taking into account the effect of intergovernmental grants discussed in earlier sections.

As this disertation is concerned with estimating the demand for local government roads the model will assume that the utility of the median voter can be measured solely in terms of two outputs, roads and the level of private goods.

Suppose the utility of any voter may be expressed by a general function consisting of two variables: the quantity of private goods and the level of expenditure on municipal roads.

$$U = U(Q_P, Q_R) \qquad (4.1)$$

Where U is the utility of the voter
Q_P is the quantity of private goods consumed
Q_R is the output of municipal roads

Suppose further that the expenditure on private goods and on taxes (to pay for the roads) is equal to the income of the voter

$$I = Q_P p_P + t \qquad (4.2)$$

where I is the income of the voter
p_P is the price of the private goods
t is the expenditure by the voter on taxes

Maximise the utility function (4.1) subject to the budget constraint (4.2) by forming a Lagrangian

$$L = U(Q_P, Q_R) - \lambda (p_P Q_P + t - I) \qquad (4.3)$$

Examining firstly the first order conditions for private goods

$$\frac{\partial U}{\partial Q_P} - \lambda p_P = 0 \qquad (4.4)$$

Defining $a = \frac{1}{\lambda}$

equation (4.4) can be rewritten in the form

$$a\frac{\partial U}{\partial Q_P} - p_P = 0 \qquad (4.5)$$

This result would be expected from the conventional model of consumer behaviour.

The form of the optimality condition for expenditure on municipal roads will depend upon the way that the municipality collects taxes. For instance if, as Atkinson and Stiglitz suggest, such roads are funded by a uniform head tax then the tax paid by the individual for municipal roads can be written as

$$t = \frac{1}{N} Q_R \qquad (4.6)$$

where N is the number of ratepayers

Substituting for t in the budget constraint (equation (4.2)) gives

$$p_P Q_P + \frac{1}{N} Q_R = I \qquad (4.7)$$

The Lagrangian can be rewritten as

$$L = U(Q_P, Q_R) - \lambda (p_P Q_P + \frac{1}{N} Q_R - I) \qquad (4.8)$$

The first order condition for the output of municipal roads is

$$\frac{\partial U}{\partial Q_R} - \lambda \frac{1}{N} = 0 \qquad (4.9)$$

Again defining $a = \frac{1}{\lambda}$

Equation (4.9) can be rewritten as

$$a\frac{\partial U}{\partial Q_R} - \frac{1}{N} = 0 \qquad (4.10)$$

Substituting these results into the budget constraint equation (4.7) gives

$$I = \frac{\frac{\partial U}{\partial Q_P}\frac{1}{N}Q_P}{\frac{\partial U}{\partial Q_R}} + \frac{\frac{\partial U}{\partial Q_R}P_P Q_R}{\frac{\partial U}{\partial Q_P}} \qquad (4.11)$$

Depending on the form of utility function adopted (4.11) can be solved and the demand equation derived. One type of model used frequently in empirical analysis of demand is the multiplicative demand model. In such a model, expenditure on municipal goods would depend on the price of municipal goods to the voter and the income of the voter, i.e.

$$\frac{Q}{N} = CP^a I^b \qquad (4.12)$$

Substituting for the price of roads $\frac{Q}{N} = C\left[\frac{1}{N}(1-g)\right]^a I^b \qquad (4.13)$

Where $Q_R N$, P_R Y are defined prevously C, a, and b are coefficients to be estimated.

This form of model has a number of significant advantages. In particular, it may be written in a linear form by taking logarithims of both sides

$$\log (Q/N) = \log C + a \log \left[\frac{1}{N}(1-g)\right] + b \log I \quad (4.14)$$

The coefficients a and b are the elasticities of demand with respect to the price of the municipal goods and the income of the median voter.

4.7 Discussion of the Model

The aim of this chapter has been to develop a model of the demand for expenditure on Local Government roads. The model has a number of advantages over a more conventional model that would estimate physical parameters of the road system as a function of a number of socio-economic parameters.

Firstly, there is an underlying theoretical justification based on the political process and, secondly, the model attempts to explain the annual expenditure on roads rather than the size of the overall network.

******

CHAPTER 5 : MODEL DATA AND ESTIMATION

5.1 Introduction

In the previous chapter, a model of the demand for expenditure on goods and services provided by local authorities was derived. This model proposed that the expenditure on municipal roads was a function of the tax price of roads and the income of the median voter.

The first section of this chapter will examine the sources of data used in the model. It will be shown that four data sets should be used, each explaining different characteristics of municipal expenditure. The final section will examine the data sources used for the other variables in the estimating equation.

5.2 Data Sets to be used in Model Estimations

It is proposed to use four data sets in the model estimations and to compare the different results obtained. The first data set comprises all Tasmanian municipalities. The second, third, and fourth data sets used are subsets of this first set of data.

In Chapter 3 the allocation of road funds to local authorities by both Commonwealth and State Governments was shown to vary according to the category of road. Local roads are classified as either urban local or rural local roads. Urban local roads comprise the majority of roads in local areas within the Hobart and Launceston statistical districts. Grants to urban and rural authorities are allocated in a different manner and it is hypothesised that this will yield different tax price elasticities. Accordingly, the second data set comprises the 34 municipalities that only receive rural local road grants while the third data set comprises the 15 municipalities that receive only urban local road grants.

As the model only considers one type of municipal output, roads, the model may be expected to yield the best results when the output of the municipality is more exclusively devoted to the provision of roads than in those municipalities where roads are a relatively minor item of expenditure.

The fourth data set, therefore, comprises the 26 municipalities which spend more than half their total revenue on roads and which have no other major output competing for expenditure.

5.3 Data Sources

All the variables are established from published sources and these are listed in Table 5.1.

TABLE 5.1 : DATA SOURCES

VARIABLE	SOURCE
Total expenditure on roads	Municipal Accounts (Published in the Government Gazette)
. Population	A.B.S.
Tax Price for Roads	
. Intergovernmental road grants	Municipal Association of Tasmania
. Population	A.B.S.
. Income of Median Voter	A.B.S. Census 1980/81 deflated by CPI movement
Income	
. Income of median voter	A.B.S. Census

5.4 Model Estimation

In Chapter 4 (Section 4.6) a model of local government expenditure was developed. It was proposed that expenditure by a municipality was a function of the product of the tax price of roads and income. In order to estimate the model, a demand equation of the form

$$\frac{Q_R}{N} = C P_R^{a} I^{b} \qquad \text{See eq (4.13)}$$

where C a and b are the coefficients to be estimated. The other symbols have previously been defined.

This model can be estimated using the double log form after substituting for the tax price of roads

$$\log \frac{Q_R}{N} = \log C + a \log \left[\frac{1}{N}\left(\underline{1}-g\right)\right] + b \log I \qquad (4.14)$$

The model was estimated using an ordinary least squares estimator. This estimator has two principal assumptions. Firstly the mean of all stochastic disturbance terms is zero and second the stochastic disturbance terms are spherical. This second condition means that the distribution of the disturbance terms are homoscedastic and are free from serial correlation.

If these conditions are not met, then the ordinary least squares estimator will not give the best linear unbiased estimates of the model. It would be necessary to use a generalised least squares estimator which is computationally more difficult.

In this particular model, cross sectioned data will be used, thus avoiding the difficulty of serial correlation. A statistical test will be performed
(see section 5.6) to determine whether the assumption of homoscedasticity is valid.

5.5 Results of Model Estimations

The demand function was estimated using the four data sets outlined earlier in this chapter (Section 5.2).

The first data set comprised all forty nine Tasmanian municipalities. The dependent variable used was expenditure of all Tasmanian municipalities for financial year 1979-80.

The results of this model are given below with 't' statistics shown in brackets below the coefficients.

Log Expenditure per head = 9.059 (2.928) - 0.631 log price of roads (-9.569)

- 0.140 Log income (-0.388)

R^2 = 0.732 F (2,46) = 62.884

The second data set comprises the thirty four municipalities that only receive rural local road grants.

The results of this model are given below with 't' statistics shown in brackets below the coefficients.

Log Expenditure per head = 3.44 (0.843) - 0.466 Log price of Roads (4.719)

+ 0.601 Log income (1.233)

R^2 = 0.624 F(2,31) 25.76

The third data set comprises the 16 municipalities that only receive urban local road grants.

Log Expenditure per head = 14.282 (2.267) - 0.725 Log price of roads (-7.382)

- 0.769 Log income (1.15)

R^2 = 0.780 F(2,13) 27.56

The fourth data set consists of the twenty five municipalities which devote more than half their total expenditures to roads and have no other major competing goods or services.

Log Expenditure per head = 8.188 (2.007) - 0.464 Log price of roads (-3.885)

+ 0.078 Log price of private goods (0.161)

R^2 = 0.454 F(2,25) 12.25

The coefficients estimated are the elasticities of expenditure with respect to tax price of roads and of other municipal goods and services. These are summarised in Table 5.2.

TABLE 5.2 : SUMMARY OF ESTIMATES OF ELASTICITY OF EXPENDITURE WITH RESPECT TO THE TAX PRICE OF ROADS, AND OF PRIVATE GOODS

Data Set	Elasticity of Expenditure on Roads w.r.t. Tax Price of Roads	Income
All Tasmanian municipalities	-0.631	n.s.
M.s receiving rural local grants	-0.466	+0.601
M.s receiving urban local grants	-0.725	-0.769
M.s with main expenditure roads	-0.464	-0.079

n.s. denotes non-statistically significant result.

5.6 Statistical Significance of Results

The models all give results with a reasonable degree of statistical significance. Three measures of goodness of fit have been used, the coefficient of multiple correlation, students 't' test and the 'F' statistic.

The coefficient of multiple correlation is a measure of the goodness of fit of the model equations. The coefficient R^2 is calculated as

$$\frac{\text{total variance - residual variance}}{\text{total variance}}$$

In the four equations estimated, the coefficient of multiple correlation varied from 0.45 to 0.78 indicating a satisfactory fit of the equations.

The 't' test determines whether the mean value of the sample is representative of the mean of population.

$$t = \frac{\text{Error in mean}}{\text{Standard error of mean}}$$

In the four equations, the coefficients for the price of roads were greater than 99% significant. However, only the estimated coefficient for income in equation (2) was significant at the 99% level and coincidentally of the correct sign.

The final statistical measure employed was the 'F' test. The 'F' test determines the overall goodness of fit of the regression equation by testing the null hypothesis that the multiple correlation in the parent population is zero. In the four models estimated, the 'F' test shows with better than 99 per cent significance that the multiple correlation of the parent population is not zero.

However, with such a large cross section data, it was considered prudent to test for heteroskedasticity. Heteroskedasticity arises when the variance of the stochastic disturbance term is not finite and constant over the sample. As Intriligator (1978) notes -

> "there is typically a problem of heteroskedasticity in cross section studies in which there is a large variation in the size of the entities for which data are obtained"

The presence of heteroskedasticity will cause two difficulties. Firstly, the least squares estimates will no longer be efficient although still linear and unbiased. Secondly, the estimated variances of the least squares estimators will be biased so that the usual tests of significance such as the 't' and 'F' tests noted earlier will be invalid.

Gleiser (1969) suggests a test for homoskedasticity which involves regressing the absolute value of the residuals obtained in the model estimation with an appropriate model variable. In this case it is considered that the variable most likely to exhibit scedastic behaviour would be the dependent variable. Gleiser specifies the disturbance term of the model as a polynomial of order g. In practice the order of the polynomial would not exceed two and so Gleiser proposes a regression equation of the form

$$u = a + bZ + e$$

where u is disturbance of the estimated model
Z is a variable in the estimated model that may exhibit scedasticity
a and b are regression coefficients
e is the residual

This equation was estimated for the overall model containing all municipalities

$$u = 1.448 - 0.00857 \underset{(1.710)}{\text{expenditure per head of population on roads}}$$

$R^2=0.0586 \quad F(1,47)=2.922$

The estimated coefficient for the potentially scedastic variable was not significantly different from zero. Accordingly, it is concluded that the disturbances in the estimated model are homoscedastic.

The absence of heteroskedasticity and serial correlation means that the disturbances of the estimated model are spherical and hence the use of ordinary least squares estimator is justified.

CHAPTER 6 : DISCUSSION OF RESULTS OF MODEL ESTIMATION

6.1 Introduction

This chapter will examine the results of the model estimations presented in the previous chapter in three ways. The first will examine the assumptions implicit in the model which were described in section 4.3. The second section of the chapter will compare the results of the model estimations with other published work in this field. Almost all of this work has been undertaken on expenditure of State Governments or Local Governments in the U.S. covering a wide range of State and municipal expenditure. Finally, the implications for expenditure on local roads in Tasmania will be evaluated.

6.2 The Multiplicity of Voter Choice Decisions

Section 4.2 discussed at some length the assumptions that are implicit in the median voter model. Some of the difficulties such as voter abstention may be treated theoretically with a reasonable degree of satisfaction. However, there is one particular problem that arises from the multiplicity of choice decisions facing the electorate that could cause instability in the estimation. This may occur if a candidate who presents a policy platform of extreme positions gains the support of minorities in sufficient quantity to defeat a candidate who adopts a median position on all issues.

The model estimations undertaken employed four data sets explicitly to investigate this problem. One of the data sets consisted of twenty four rural Tasmanian municipalities where expenditure represented over fifty per cent of municipal expenditure and there are no significant competing expenditures. It would be unlikely that a candidate who offered a policy position that was significantly different to that of the median voter in these municipalities where a single issue predominates, would be successful in gaining election.

It would be expected that the statistical fit of the model estimation using this subset of Tasmanian municipalities might be better than that of the model employing all Tasmanian municipalities in its estimation table if voters habitually vote in other municipalities for those candidates presenting a coalition of minority positions. However, it can be seen from the results of the models reported in section 5.6 that this model gave a rather worse fit than the other three models.

This does not conclusively prove that in local elections the Council necessarily reflects the views of the median voter. It may mean that in small muncipalities other factors such as preferences for individual candidates may outweigh the policies that they represent.

6.3 Comparison with Results of Other Median Voter Models

There have been a number of attempts to use the median voter model to analyse the expenditure behaviour of government. Barr and Downs (1966) and Davis and Haines (1966) were among the first to undertake empirical research in this field. Later and more sophisticated models were estimated by Borcherding and Deacon (1972), Bergstrom and Goodman (1973), Peterson (1973,1975), Clotfelter (1976), Pommerhne and Frey (1976), Deacon (1978) and Pommerehne (1978).

Peterson and Clotfelter were concerned with levels of funding for schools. In America, schools are governed by Schools Boards which are elected. Pommerehne was concerned with electoral decisions of referenda held in Switzerland. It is considered that these papers represent a different electoral system to that being considered in Tasmania. Borcherding and Deacon, Bergstrom and Goodman, and Deacon are all reporting on electoral decisions in the United States where a large range of policies were being voted upon.

Borcherding and Deacon estimated a Cobb Douglas demand model using cross section data grouped so as to compare those States with a constant labour share for each good or service provided. Their model estimated per capita expenditure as a function of the physical output of the good under consideration, the wage rate and labour share of that output and the income of the mean voter. Unfortunately, the results of the estimations of the price elasticity of highways were uniformly insignificant.

Bergstrom and Goodman were concerned with estimating local government expenditure by a median voter model. Their data set consisted of 826 municipalities located in ten States with population of between 10,000 and 150,000. Expenditure was estimated as a function of the population of the municipality, the median income and the tax share of the citizen with the median income. Bergstrom and Goodman estimated models for three different local government outputs, general expenditure (excluding education and welfare), police, and parks and recreation. They reported elasticities of expenditure with respect to tax share for all goods and services (excluding education and welfare) ranging from - 0.13 to - 0.50. However, they were less successful with other types of municipal output and were only infrequently able to determine significant coefficients.

Deacon's model was rather different in its scope and aims. Deacon was concerned with possible substitution effects in public consumption. The knowledge of these effects would enable estimates of the shift in budget allocations between categories of public expenditure that might result from an increase or decrease in costs of specific services.

In contrast to Bergstrom and Goodman, and to Borcherding and Deacon, Deacon used a fifty year time series of six categories of public expenditure in Seattle. The model estimated price and expenditure elasticities for six services provided by the city. The expenditure elasticities were similar to ordinary income elasticities of demand except that income was replaced by aggregate public sector expenditure.

The results of the model are not directly comparable with those of the two earlier writers discussed above because of the use of time series as opposed to cross section data. However, Deacon found that all goods and services provided by the City were inelastic. He further found that the expenditure elasticities, except in one case, were unitary. Thus, expansion paths for each service could be regarded as a ray emanating from the origin.

The results of the three models discussed in this section are reproduced in Table 6.1. The results of the model developed in Chapter 4, which are reported in Table 5.2, are comparable in magnitude with those of other writers. Clearly the elasticities presented are compensated elasticities while those of Borcherding and Deacon and Bergstrom and Goodman are ordinary elasticities. While Deacon reports compensated elasticities, these have been obtained using time series estimation and hence would be expected to be somewhat lower than those estimated from cross section data.

6.4 Implications of Results on Municipal Expenditures

The estimated elasticities from the models show that the provision of roads is quite price elastic.

Fisher(1982) discussed the effect of lump sum grants on municipal expenditure. He discussed the effect noted in the literature that lump sum grants increase local government expenditures more than equivalent increases in private income. This is known as the flypaper effect because grants for public expenditure "stick" to public output. Fisher considers that there may be two causes for this behaviour.

The first is that Councils spend grants because they incur no political cost in collecting that revenue. The alternative view is that while grants are perceived as lump sum grants, they have substantial price effects. For example, Fisher quotes from Chernick (1979) who proposes a model where bureaucrats allocate grants to maximise their own utility which is a function of resulting public output. Chernick envisages negotiation between grantor and recipient about the conditions for the project.

In both these views, the more price elastic public outputs would receive larger grants as this produces the most output at the least cost. This result has strong implications for central government. If it is desired to stimulate expenditure at the municipal level by making grants, then lowering the tax price of urban roads may be more stimulatory than providing grants to rural roads.

TABLE 6.1 : COMPARISON OF ESTIMATED ELASTICITIES OF EXPENDITURE wrt tax price

Author(s)	Municipal Good	Estimates of Elasticity wrt Price
Borcherding and Deacon	Highways Group 2	-0.1752 (n.s.)
	Highways Group 1	0.5864 (n.s.)
	Parks and Recreation	-0.4958 (n.s.)
Bergstrom and Goodman	General Expenditure	-0.23
	Parks and Recreation	-0.19
Deacon	Parks	0.4535
	Administration	-0.4209
Model Estimates	Roads	-0.767

CHAPTER 7

SUMMARY

This dissertation has attempted to examine the demand for roads provided by local government in Tasmania. It was found that there were considerable difficulties involved in the development of a suitable model with which to estimate the demand for a product that is not freely bought or sold in the market place. Accordingly, the model that is developed is based on the political process in as much that it assumed that the municipal councils are assumed to maximise the utility of the electorate.

The development of models based on the democratic process dates back to Wicksell in the last century. The democratic process has attracted the attention of many of this century's foremost economists and notable contributors include Hotelling, Arrow, Downes, Black, Baumol and Stigler. Economic models based on the actions of the median voter were particularly developed in the past decade. However, no application of such models to local road expenditures in Australia has been undertaken.

The basic principle underlying the median voter model of the democratic process is that the demands of the electorate may be represented by the demands of the median voter who is assumed to cast the decisive vote at an election. A complementary requirement is the need for candidates to vary their policies to conform to the wishes of the electorate.

This form of model is well suited to an examination of the political process in Tasmania. Municipal councils are elected on a rotating basis so that there are elections every year. Municipalities are, in the main, small. Only twelve of the forty nine have populations of over 10,000 and, in nearly half the electorates, expenditure on roads accounts for over half of total expenditure and expenditures on other services is only minor. Finally, there are no party politics in local governments in Tasmania.

The conventional median voter model described in Chapter 4 needs some amendment to take into account the effects of intergovernmental grants. The provision of matching grants was shown to effectively reduce the apparent price of municipal goods that are beneficiaries. A further extension to the conventional model is needed because of the difficulty involved in measuring the output of municipal roads. The solution to this latter problem was the adoption of expenditure as a measure of output.

The fully developed model consists of a demand function which seeks to measure the demand by the median voter for roads provided by the municipality in terms of the tax price of roads and the income of the voter.

Four models were estimated. The first comprised a cross section data set of all Tasmanian municipalities. Cross section data was used because it is assumed that at elections the electorate is concerned only with the situation in the future and that the voter and the candidates cannot be involved in an interrelationship over a series of elections.

The second and third models included only those municipalities which receive rural and urban road grants respectively. These grants are allocated by the State Department of Main Roads according to formulae which differ depending on whether the road is urban or rural.

The fourth data set comprises twenty four of the smaller Tasmanian municipalities where expenditure on roads accounts for over half of total expenditure. This particular set of data also provided a means to test the assumption that the candidate representing the position of the median voter would be elected. In these municipalities the electorate are essentially faced with a number of candidates offering views about the level of expenditure on only one category of municipal output. This should minimise the possibility for candidates representing extreme views attracting support from a coalition of minority interests.

The estimated models provided very satisfactory results both in the plausibility of the estimated coefficients and in their statistical significance.

The model estimations showed three main results. Firstly, while the assumption that the median voter model represented voter behaviour could not be clearly proved there was a very good statistical fit for each of the equations estimated. The model equation, which employed the set of data comprising solely those municipalities where expenditure on roads dominated all others, did not perform in a manner that was significantly better in a statistical sense as might have been expected.

The second result of the model was that the estimations were comparable in magnitude to those found by other writers who estimated demand elasticities for local and State government services in the United States.

The third result was that the tax price elasticity of roads is higher in urban rather than rural municipalities. This may show that roads are a more essential municipal output in rural areas reflecting their much higher share of municipal expenditure.

The aim of this dissertation has been to estimate the demand for local government roads in terms of the cost of their provision. While the basic premise of the dissertation has been fulfilled, the model could also be extended to consider the interaction between grants, municipal taxes, and output of municipal goods through the simultaneous estimation of tax rate and production of municipal goods.

REFERENCES

Advisory Council for Intergovernment Relations Report 4, The Provision of Roads - Hobart, 1981.

Atkinson, A.B. and Stiglitz, J.E. (1980), Lecture on Public Economics (McGraw-Hill, 1980) Lecture 10.

Barlow, R. (1970) "Efficiency Aspects of Local School Finance". Journal of Political Economy, September/October 1970, 78, pp 1028-1039.

Bergstrom, T.C. and Goodman, R.P. (1975) 'Private Demands for Public Goods', - American Economic Review, June 1973, 63, pp 280-296.

Black, D The Theory of Committees and Election Cambridge: Cambridge University Press, (1958).

Black, J.A. and Blunden, W.R. (1984) The Distribution Cost Equation for Freight, Proceedings 9th ATRF Adelaide.

Borcherding, T.E. and Deacon, R.T. (1972) The Demand for the Service of Non Federal Governments, American Economic Review December 1972, 62, pp.891-901.

Both, G.J., and Bayley, C., (1976b) Evaluation Procedures for rural road and structure projects. Proceedings 8th A.A.R.A. Conference, Transport Planning and Economics, Vol. 8, Part 6, 6-25.

Bradford, D.F. and Oates W.E. (1971) "Towards a Predictive Theory of Intergovernmental Grants", American Economic Review, 1971b), pp.440-448.

Bureau of Transport Economics, 1979, An Assessment of the Australian Road System, 1979, Parts 1 and 2, AGPS, Canberra.

Bureau of Transport Economics, 1982, Assessment of the Australian Road System : a case study in Gunning Shire, N.S.W., Occasional Paper 55, 1983.

Chernick.H.A., An Economic Model of the Distribution of Project Grants Fiscal Federalism and Grants in Aid (P.Mieszkowski and W.Oakland Eds) The Urban Institute Washington, (1979).

Commonwealth Bureau of Roads, Report on the Australian Road Systems 1968, Melbourne, 1969.

Commonwealth Bureau of Roads, Report on the Australian Road Systems, 1973, Melbourne, 1973.

Commonwealth Bureau of Roads, Report on the Australian Road Systems, 1975, Melbourne, 1975.

Deacon, R.T., (1978) A Demand Model for the Local Public Sector, Review of Economics and Statistics, May 1978, 60, pp.184-192.

Diamond, P.A. and McFadden, D.L., 1974, "Some uses of the Expenditure Function in Public Finance" Journal of Public Economics, 3, 1974, pp. 3.21.

Downs, A., 1954 An Economic Theory of Democracy, (New York : Harper and Row).

Dudley,L., and Montmarquette, C., (1981) The Demand for Military Expenditures : An International Comparison, Public Choice 37, Pp5-31

Fisher,R.C., (1982) Income and Grant Effects on Local Expenditure. The Flypaper Effect and Other Difficulties J.Urban Economics 12 , Pp324-345

Green, H.A.J., (1971), Consumer Theory London, Macmillan

Hotelling, H., (1929) Stability in Competition, Economics Journal, March 1929 39, pp.41-57.

Inman,R.P., (1979) The Fiscal Performance of Local Governments. An Interpretive Review Current Issues in Urban Economics (P.Mieszkowski and M.Strazheim Eds.) Baltimore

Kmenta, J., Elements of Econometrics, New York, Macmillan, 1971

Layard, P.R.G., and Walters, A.A., Microeconomic Theory , McGraw Hill , New York , 1978

Mueller, D., Public Choice, Cambridge : Cambridge University Press, 1979.

Nitzan, S. (1977) "Revenue Sharing in Multiperson Public Choice Models", Quarterly Journal of Economics, 1977, LIXI, pp314-325.

Slack, E. (1980) "Local Fiscal Response to Intergovernmental Transfers" Review of Economics and Statistics, 62, (1980), pp.364-370.

Stanley, J. and Starkie, D.N.M., (1982) A Revised Framework for Evaluating Investment in Rural Local Roads, Forum Papers 7th Australian Transport Research Forum.

Stanley, J. and Starkie, D.N.M., (1983) "Grant Aiding Rural Local Roads - An Alternative Approach" Transportation Planning and Technology 1983, Vol. 8, pp. 191-201.

Starkie, D.N.M., (1981) Economic Efficiency and Road Expenditures. The Case of Rural Arterial, Working Paper 81-1, University of Adelaide

State Grants Commission, (1981) Annual Report 1979-1980, Tasmania Government Printer, Hobart.

Stokes, D.E., Spatial Models of Party Competition, American Political Science Revue, June 1963, 57 pp.368-77.